Test Bank for Biology 13th Edition by Mader

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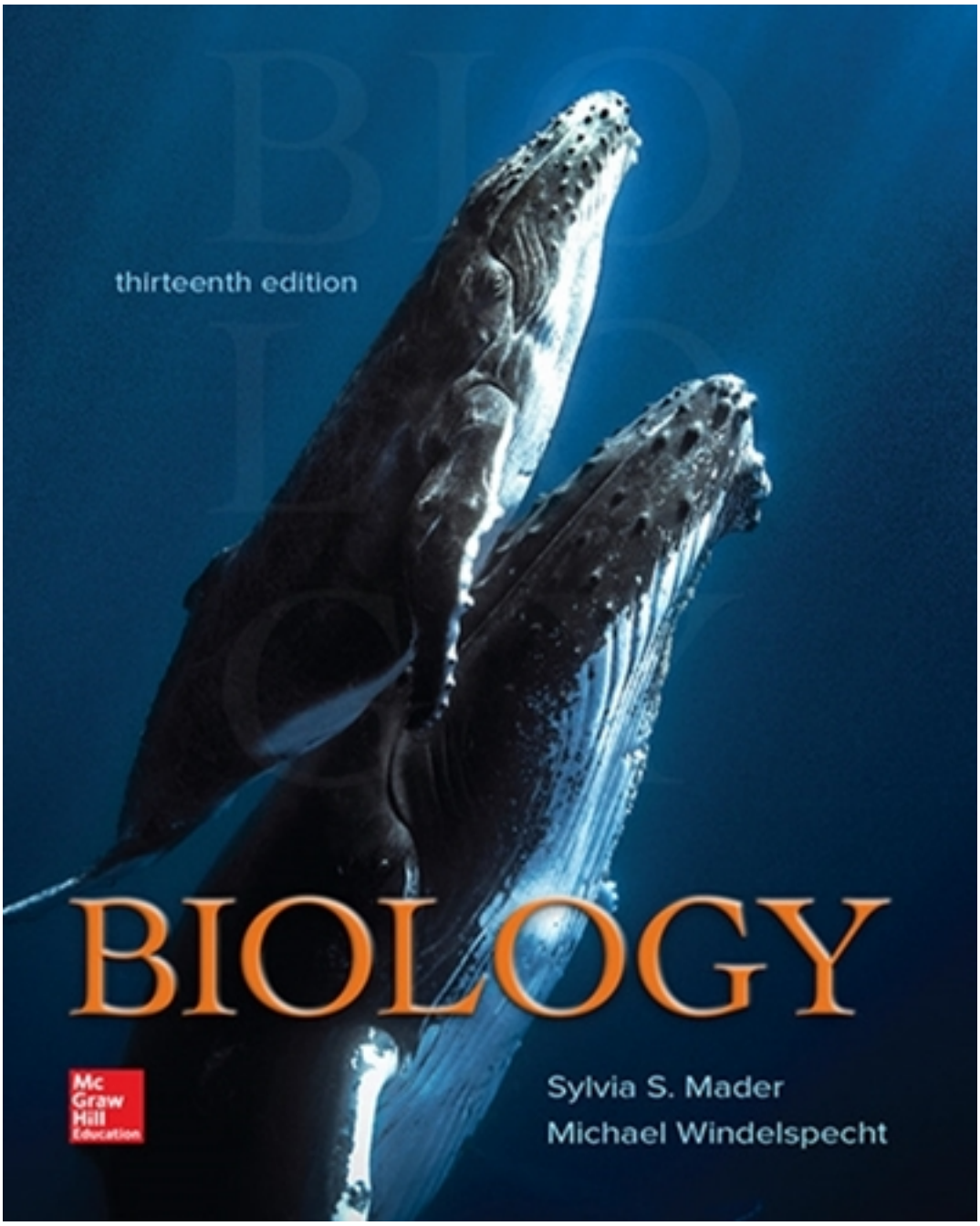


Test Bank

Biology, 13e **(Mader)**
Chapter 2 Basic Chemistry

1) Which of the following elements would be the most reactive with other elements?
A) boron, #5
B) neon, #10
C) argon, #18
D) helium, #2

Answer: A
Explanation: Correct.
Section: 02.01
Topic: Chemistry; Chemical Elements
Bloom's: 3. Apply
Learning Outcome: 02.01.04 Determine how electrons are configured around a nucleus.
Accessibility: Keyboard Navigation

2) Your roommate has heartburn and you hand her a bottle of antacids. She wants you to explain how the antacids will make her feel better. What do you tell her?
A) Antacids dilute the solution, therefore lowering the pH.
B) Antacids are bases and can take up H^+ thereby reducing the acidity of the solution.
C) Antacids are bases and by definition can take up OH^- thereby increasing the acidity of the solution.
D) Antacids contain mostly water and so they neutralize the solution.

Answer: B
Explanation: Antacids are bases and by definition can absorb H^+ out of a solution.
Section: 02.04
Topic: Chemistry; Acids and Bases
Bloom's: 3. Apply
Learning Outcome: 02.04.01 Distinguish between an acid and a base.
Accessibility: Keyboard Navigation

3) If you place the corner of a paper towel into a droplet of water, the water moves into the paper towel. Which of the following would explain the movement of the water?
A) surface tension
B) cohesion
C) adhesion
D) Both cohesion and adhesion.

Answer: D
Explanation: Both cohesion and adhesion explain the movement of water through a paper towel. Cohesion is holding the water molecules together within the droplet. The water molecules are attracted to the paper which is adhesion.
Section: 02.03
Topic: Chemistry; Chemistry of Water
Bloom's: 3. Apply
Learning Outcome: 02.03.02 Describe why the properties of water are important to life.
Accessibility: Keyboard Navigation

4) The periodic table displays the following information about the element phosphorus:

15

P

30.794

Based on this information, which of the following are true statements about phosphorus? Select all that apply.
A) The atomic number of phosphorus is 30.794.
B) Phosphorus has 15 protons.
C) Phosphorus has 30.794 electrons.
D) Phosphorus has a complete valence shell.
E) Phosphorus will form chemical bonds with other elements.

Answer: B, E

The atomic number of phosphorus is 15. This means it has 15 protons (15 positive charges) and therefore 15 electrons. The first two electron shells would be full but its valence shell would be incomplete with 5 out of 8 electrons and therefore it will form chemical bonds with other elements.
Section: 02.01
Topic: Chemical Elements
Bloom's: 3. Apply
Learning Outcome: 02.01.02 Use the periodic table to evaluate relationships between atomic number and mass number.; 02.01.04 Determine how electrons are configured around a nucleus.
Accessibility: Keyboard Navigation

5) If the atomic number of chlorine is 17 and the atomic mass is 35, how many neutrons are there in the nucleus?
A) 17
B) 18
C) 35
D) 70

Answer: B
Explanation: The number of protons = the atomic number; atomic mass is protons + neutrons. If the atomic mass is 35 then 17 + N = 35. There are 18 neutrons.
Section: 02.01
Topic: Chemistry; Chemical Elements
Bloom's: 3. Apply
Learning Outcome: 02.01.02 Use the periodic table to evaluate relationships between atomic number and mass number.
Accessibility: Keyboard Navigation

6) What relationship can be determined from the following information:

- The radioactive isotope iodine 131 has a half-life of 8.1 days and emits 0.8 MeV (milli-electronvolts) of energy.
- The radioactive isotope phosphorus 32 has a half-life of 14.3 days and emits 1.7 MeV of energy.
- The radioactive isotope phosphorus 33 has a half-life of 25.5 days and emits 0.25 MeV of energy.
- The radioactive isotope sulfur 35 has a half-life of 87.5 days and emits 0.2 MeV of energy.

A) The longer the half-life, the more energy emitted by the particles.
B) The longer the half-life, the less energy emitted by the particles.
C) Radioisotopes of the same element must emit the same amount of energy in their emissions and decay at the same rate.
D) Adjusted for time, radioisotopes emit the same amount of energy in their emissions.
E) Energy and half-life are not directly related.

Answer: E
Explanation: Energy and half-life are not directly related.
Section: 02.01
Topic: Chemistry; Chemical Elements
Bloom's: 3. Apply
Learning Outcome: 02.01.03 Describe how variations in an atomic nucleus account for its physical properties.
Accessibility: Keyboard Navigation

7) Which statement is NOT true about subatomic particles?
A) Protons are found in the nucleus.
B) Neutrons have no electrical charge.
C) Electrons contain much less mass than neutrons.
D) Electrons are found in orbitals around the nucleus.
E) All electrons in an atom contain the same amount of energy.

Answer: E
Explanation: Correct.
Section: 02.01
Topic: Chemistry; Chemical Elements
Bloom's: 2. Understand
Learning Outcome: 02.01.01 Describe how protons, neutrons, and electrons relate to atomic structure.
Accessibility: Keyboard Navigation

8) The periodic table gives the following information about oxygen:

8

O

15.99

A scientific article that you are reading mentions oxygen-18. How is oxygen-18 different from the typical oxygen atom described in the periodic table? Select all that apply.
A) Oxygen-18 is an isotope.
B) Oxygen-18 has 10 additional protons.
C) Oxygen-18 has 2 additional neutrons.
D) Oxygen-18 has a full valence shell and is therefore nonreactive.
E) Oxygen-18 has more protons and fewer neutrons than a typical oxygen atom.

Answer: A, C

Oxygen-18 is an isotope of oxygen. Isotopes differ in their number of neutrons. A typical oxygen has an atomic mass of 16 (8 protons + 8 neutrons), oxygen 18 would still have 8 protons (proton number does not change) but it would have 10 neutrons.
Section: 02.01
Topic: Chemical Elements
Bloom's: 3. Apply
Learning Outcome: 02.01.03 Describe how variations in an atomic nucleus account for its physical properties.
Accessibility: Keyboard Navigation

9) Which is NOT true about the electrical charges of elements?
A) Protons carry a positive charge.
B) In an atom, the number of protons and neutrons must be equal.
C) An atom is neutral when the positive and negative charges balance.
D) Neutrons have no electrical charge.

Answer: B
Explanation: Correct.
Section: 02.01
Topic: Chemistry; Chemical Elements
Bloom's: 2. Understand
Learning Outcome: 02.01.01 Describe how protons, neutrons, and electrons relate to atomic structure.
Accessibility: Keyboard Navigation

10) In a water molecule,
A) the oxygen atom is more electronegative than the hydrogen atoms.
B) the oxygen atom has an overall negative charge with the hydrogen atoms having an overall positive charge.
C) unequal sharing of electrons results in a polar molecule.
D) All of the choices are correct.

Answer: D
Explanation: All of the choices are correct.
Section: 02.02
Topic: Chemistry; Chemistry of Water
Bloom's: 1. Remember
Learning Outcome: 02.02.03 Explain the difference between a polar and a nonpolar covalent bond.
Accessibility: Keyboard Navigation

11) An atom's atomic mass is best described as the mass of
A) the protons it contains.
B) the neutrons it contains.
C) electrons in the outermost shell.
D) protons and neutrons it contains.
E) protons and electrons it contains.

Answer: D
Explanation: An atom's atomic mass is the sum of its protons and neutrons.
Section: 02.01
Topic: Chemistry; Chemical Elements
Bloom's: 1. Remember
Learning Outcome: 02.01.02 Use the periodic table to evaluate relationships between atomic number and mass number.
Accessibility: Keyboard Navigation

12) An article in a medical journal indicates that researchers have used an isotope ^{3}H to trace a certain metabolic process. From the symbol that is given, we know this is a hydrogen isotope with
A) three protons.
B) three neutrons.
C) three electrons.
D) one proton and two neutrons.
E) two protons and one neutron.

Answer: D
Explanation: From the symbol that is given, we know this is a hydrogen isotope with one proton and two neutrons. Hydrogen normally has one proton and no neutrons. Proton number never changes which means that a hydrogen atom with an atomic mass of 3, must have 1 proton and 2 neutrons.
Section: 02.01
Topic: Chemistry; Chemical Elements
Bloom's: 3. Apply
Learning Outcome: 02.01.03 Describe how variations in an atomic nucleus account for its physical properties.
Accessibility: Keyboard Navigation

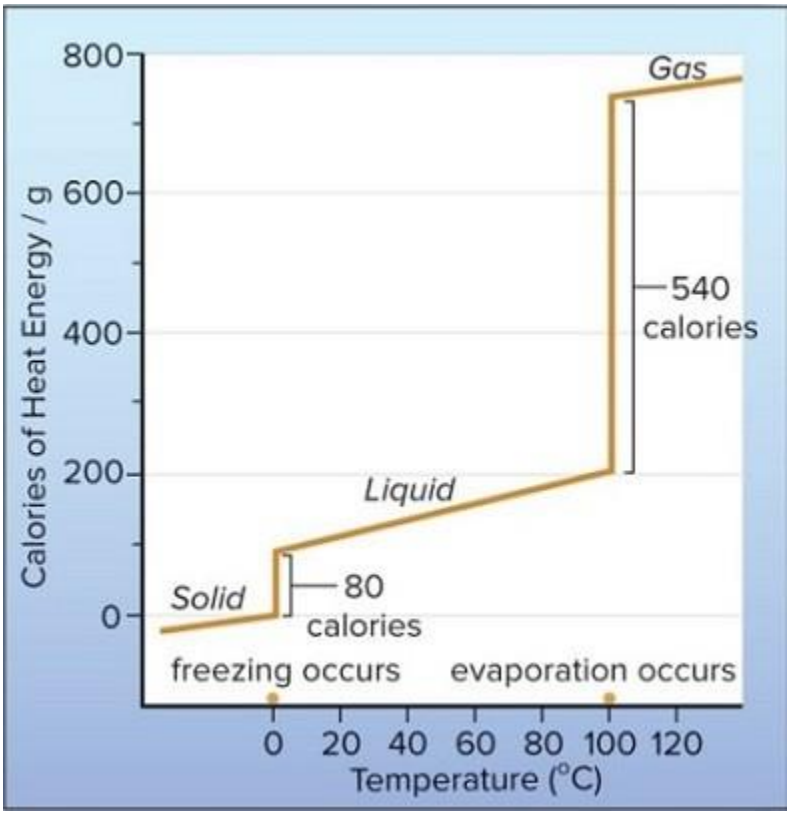
13) Both ^{18}O and ^{16}O are found in nature. However, ^{16}O is the most common. Therefore,
A) these are different elements.
B) oxygen atoms can have eight or 10 neutrons.
C) ^{18}O has two additional electrons in its outer shell.
D) ^{18}O is the form of oxygen that provides living cells with life.
E) only the common form of ^{16}O can bond with hydrogen atoms to form H_2O.

Answer: B
Explanation: Oxygen atoms can have eight or 10 neutrons. These are the same element.
Section: 02.01
Topic: Chemistry
Bloom's: 3. Apply
Learning Outcome: 02.01.01 Describe how protons, neutrons, and electrons relate to atomic structure.
Accessibility: Keyboard Navigation

14) To determine the age of fairly recent fossils and organic artifacts, it is possible to analyze the amounts of the isotopes ^{14}C and ^{14}N, because over time the ^{14}C-which originated in the atmosphere-breaks down into ^{14}N through a process known as beta decay. What net change occurred for this to happen?
A) The ^{14}C lost an electron.
B) The ^{14}C gained an electron.
C) The ^{14}C lost a proton.
D) The ^{14}C gained a proton.
E) The ^{14}C gained a neutron.

Answer: D
Explanation: The change occurred because ^{14}C gained a proton. Carbon originally had 6 protons. Once carbon gains a proton, its atomic number changes from 6 to 7, effectively changing it into nitrogen.
Section: 02.01
Topic: Chemistry; Chemical Elements
Bloom's: 4. Analyze
Learning Outcome: 02.01.03 Describe how variations in an atomic nucleus account for its physical properties.
Accessibility: Keyboard Navigation

15) What does this graph reveal about the heat of vaporization and the heat of fusion?



Answer: After studying the graph, one sees that it takes over 500 calories of heat to convert one gm of the hottest liquid water to a gas. To convert one gm of the coldest liquid water to a solid requires the loss of about 80 calories.
Section: 02.03
Topic: Chemistry; Chemistry of Water
Bloom's: 4. Analyze
Learning Outcome: 02.03.03 Analyze how water's solid, liquid, and vapor states allow life to exist on Earth.

16) Which of the following statements is NOT true about electron configurations?
A) If an atom has only one shell, it is complete with two electrons.
B) If an atom has two or more shells, the octet rule applies.
C) If an atom has two or more shells, the outer shell is complete with eight electrons.
D) Atoms with more than eight electrons in the outer shell react by gaining electrons.
E) Atoms with eight electrons in the outer shell are not reactive.

Answer: D
Explanation: Atoms with 8 electrons in the outer shell have a complete valence and would not gain any more electrons.
Section: 02.01
Topic: Chemistry; Chemical Elements
Bloom's: 2. Understand
Learning Outcome: 02.01.04 Determine how electrons are configured around a nucleus.
Accessibility: Keyboard Navigation

17) A valence shell is best described as
A) the electron shell closest to the nucleus.
B) the outermost electron shell of an atom.
C) the volume of space in which electrons are most often found.
D) the original energy level of electrons in photosynthesis.

Answer: B
Explanation: The valence shell is the outermost electron shell of an atom.
Section: 02.01
Topic: Chemistry; Chemical Elements
Bloom's: 1. Remember
Learning Outcome: 02.01.04 Determine how electrons are configured around a nucleus.
Accessibility: Keyboard Navigation

18) Prior to prescription medications to control stomach acid and heart burn, people consumed baking soda (sodium bicarbonate) to alleviate their symptoms. To be effective, baking soda must:
A) effectively buffer stomach acid by releasing H^+.
B) release water and dilute the stomach acid.
C) block acid production by combining with OH^-.
D) neutralize stomach acid by combining with excess H^+.

Answer: D
Explanation: Sodium bicarbonate neutralizes stomach acid by combining with excess H^+.
Section: 02.04
Topic: Chemistry; Chemistry of Water
Bloom's: 3. Apply
Learning Outcome: 02.04.03 Analyze how buffers prevent large pH changes in solutions.
Accessibility: Keyboard Navigation

19) Which statement is NOT true about ionic bonds?
A) One atom acts as an electron donor and another atom acts as an electron acceptor.
B) Electrons are completely lost or gained in ion formation.
C) An ion has the same number of electrons as a nonionic atom of the same element.
D) An ionic bond occurs between positive ions and negative ions.
E) A salt such as NaCl is formed by an ionic reaction.

Answer: C
Explanation: Correct. In order for an atom to become an ion, it must either gain or lose one or more electrons.
Section: 02.02
Topic: Chemistry; Molecules and Compounds
Bloom's: 2. Understand
Learning Outcome: 02.02.02 List the different types of bonds that occur between elements.
Accessibility: Keyboard Navigation

20) Which statement is NOT true about covalent bonds?
A) Covalent bonds form when an electron is completely lost or gained from an atom.
B) A covalent molecule contains one or more covalent bonds.
C) A single covalent bond is drawn as a line between two atoms.
D) A pair of electrons is shared between two atoms for each covalent bond.
E) Shared electrons allow an atom to complete its valence shell in a covalent molecule.

Answer: A
Explanation: Correct. Ionic bonds form when atoms gain or lose electrons. Covalent bonds form when atoms share one or more pairs of electrons.
Section: 02.02
Topic: Chemistry; Molecules and Compounds
Bloom's: 2. Understand
Learning Outcome: 02.02.02 List the different types of bonds that occur between elements.
Accessibility: Keyboard Navigation

21) Which statement is NOT true about polar covalent bonds?
A) When covalent bonds are nonpolar, the electrons are shared fairly equally between the atoms.
B) Polar covalent bonds are important in the characteristics of water.
C) Electrons are shared unequally in a polar covalent bond.
D) The larger atom in a polar bond attracts the electron more strongly than the smaller atom.
E) The oxygen of a water molecule is electropositive relative to the hydrogen.

Answer: E
Explanation: Correct. The oxygen atom in a water molecule is electronegative relative to the hydrogen.
Section: 02.02
Topic: Chemistry; Molecules and Compounds
Bloom's: 2. Understand
Learning Outcome: 02.02.03 Explain the difference between a polar and a nonpolar covalent bond.
Accessibility: Keyboard Navigation

Which of the following statements is/are true about the pH scale?

22) The scale indicates the relative concentrations of hydrogen and hydroxide ions in a solution.

Answer: TRUE
Explanation: It is true that the scale indicates the relative concentrations of hydrogen and hydroxide ions in a solution.
Section: 02.04
Topic: Chemistry; Acids and Bases
Bloom's: 1. Remember
Learning Outcome: 02.04.02 Explain the relationship between H or OH- concentration and pH.
Accessibility: Keyboard Navigation

23) The scale ranges from 1 to 15.

Answer: FALSE
Explanation: The scale ranges from 1 to 14.
Section: 02.04
Topic: Chemistry; Acids and Bases
Bloom's: 1. Remember
Learning Outcome: 02.04.01 Distinguish between an acid and a base.
Accessibility: Keyboard Navigation

24) pH 7 has a balanced level of H^+ and OH^-.

Answer: TRUE
Explanation: It is true that pH 7 has a balanced level of H^+ and OH^-.
Section: 02.04
Topic: Chemistry; Acids and Bases
Bloom's: 1. Remember
Learning Outcome: 02.04.01 Distinguish between an acid and a base.
Accessibility: Keyboard Navigation

25) Any substance below pH 7 is considered acidic and any substance above pH 7 is considered basic or alkaline.

Answer: TRUE
Explanation: It is true that anything below pH 7 is acidic and above pH 7 is basic.
Section: 02.04
Topic: Chemistry; Acids and Bases
Bloom's: 1. Remember
Learning Outcome: 02.04.01 Distinguish between an acid and a base.
Accessibility: Keyboard Navigation

26) A change of one pH unit represents a ten-fold increase or decrease in hydroxide ion concentration.

Answer: TRUE
Explanation: It is true that a change of one pH unit represents a ten-fold increase or decrease in hydroxide ion concentration.
Section: 02.04
Topic: Chemistry; Acids and Bases
Bloom's: 2. Understand
Learning Outcome: 02.04.02 Explain the relationship between H or OH- concentration and pH.
Accessibility: Keyboard Navigation

27) The blood buffer reactions described by H_2CO_3  $H^+ + HCO_3^-$ indicate that
A) scientists are uncertain which direction the equation flows.
B) the reaction can flow either direction depending on whether there is too much H^+ or more H^+ is needed.
C) any reaction in one direction causes an immediate reverse reaction.
D) chemicals can swing wildly from acidic to basic.
E) the reaction goes back and forth in an unpredictable manner.

Answer: B
Explanation: The reaction can flow either direction depending on whether there is an excess of hydrogen ions (H^+) or not enough hydrogen ions.
Section: 02.04
Topic: Chemistry; Acids and Bases
Bloom's: 2. Understand
Learning Outcome: 02.04.03 Analyze how buffers prevent large pH changes in solutions.

28) From the below table, it is apparent that

Bond	Energy (kcal/mol)
C-C	83
C=C	146
C-O	84
C=O	170

A) double bonds are stronger than single bonds.
B) double bonds are weaker than single bonds.
C) carbon bonds are the strongest bonds.
D) carbon forms only single bonds.

Answer: A
Explanation: From the information in the chart, it can be inferred that double bonds are stronger than single bonds.
Section: 02.02
Topic: Chemistry; Molecules and Compounds
Bloom's: 4. Analyze
Learning Outcome: 02.02.02 List the different types of bonds that occur between elements.
Accessibility: Keyboard Navigation

29) The characteristic way in which atoms of an element react is most related to the
A) number of electrons in the valence shell.
B) number of electrons in the innermost shell.
C) number of neutrons in the nucleus.
D) size of the nucleus.

Answer: A
Explanation: The characteristic way in which atoms of an element react is most related to the number of valence electrons in the outermost shell.
Section: 02.01
Topic: Chemistry; Chemical Elements
Bloom's: 2. Understand
Learning Outcome: 02.01.04 Determine how electrons are configured around a nucleus.
Accessibility: Keyboard Navigation

30) As a solid, water floats. This means that
A) solid water is less dense than liquid water.
B) organisms in ponds, lakes, and reservoirs can survive under the ice cover.
C) the hydrogen bond arrangement differs between ice and liquid water.
D) All of the choices are correct.

Answer: D
Explanation: All of the choices are correct.
Section: 02.03
Topic: Chemistry; Molecules and Compounds
Bloom's: 2. Understand
Learning Outcome: 02.03.03 Analyze how water's solid, liquid, and vapor states allow life to exist on Earth.
Accessibility: Keyboard Navigation

31) A coastal climate is moderated primarily by which of the following properties of water?
Water
A) is the universal solvent.
B) is cohesive and adhesive.
C) has a high heat of evaporation.
D) has a high surface tension.

Answer: C
Explanation: A coastal climate is moderated primarily because water has a high heat of evaporation.
Section: 02.03
Topic: Chemistry; Chemistry of Water
Bloom's: 2. Understand
Learning Outcome: 02.03.02 Describe why the properties of water are important to life.
Accessibility: Keyboard Navigation

32) Human blood has a pH of about 7.4. This is
A) neutral.
B) very acidic.
C) slightly acidic.
D) slightly basic.

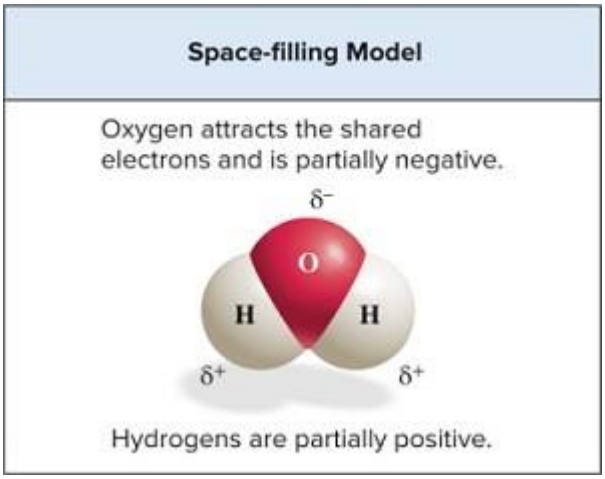
Answer: D
Explanation: Human blood has a pH of about 7.4. This is slightly basic.
Section: 02.04
Topic: Chemistry; Acids and Bases
Bloom's: 1. Remember
Learning Outcome: 02.04.01 Distinguish between an acid and a base.
Accessibility: Keyboard Navigation

33) All of the following are examples of damage caused by acid deposition from rain EXCEPT
A) leaching of aluminum from the soil into lakes which results in the formation of toxic methyl mercury from mercury in the lake sediments.
B) weakens trees in the forests and kills seedlings.
C) increased agricultural yields.
D) damage to marble and limestone monuments.

Answer: C
Explanation: Correct.
Section: 02.04
Topic: Chemistry; Acids and Bases
Bloom's: 2. Understand
Learning Outcome: 02.04.01 Distinguish between an acid and a base.
Accessibility: Keyboard Navigation

34) Draw the structural formula of a single water molecule. Note the location of partial positive and negative charges. Label the covalent bonds.

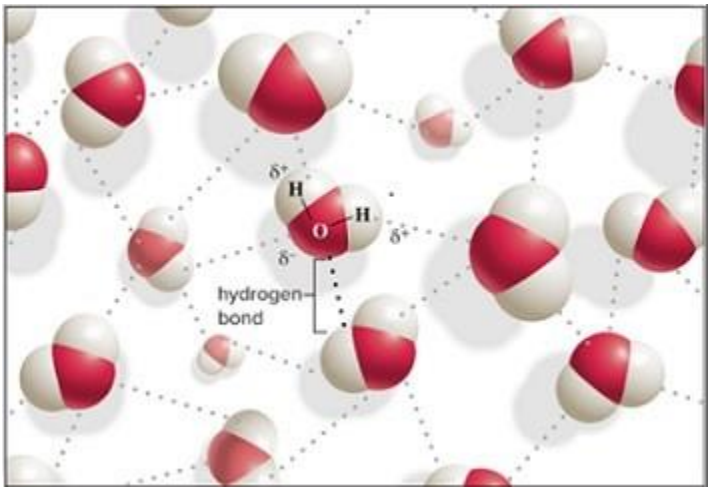
Answer:



Note the diagrams above. The covalent bonds occur between the hydrogen and oxygen molecules. There are two covalent bonds in every water molecule.
Section: 02.02
Topic: Chemistry; Chemistry of Water
Bloom's: 6. Create
Learning Outcome: 02.02.01 Describe how elements are combined into molecules and compounds.

35) Draw three water molecules and the hydrogen bonding that may occur between the molecules. Define hydrogen bonding and explain how and why it occurs.

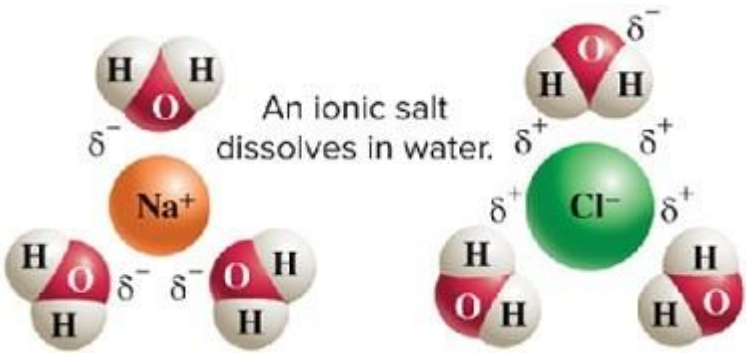
Answer:



The hydrogen bonding is shown as dotted lines between the water molecules. Hydrogen bonding is the weak attraction between a covalently bonded hydrogen atom and an electronegative atom taking part in another covalent bond. It occurs between a partially positive hydrogen in one water molecule and a partially negative oxygen in another water molecule. The hydrogen has a partially positive charge and the oxygen has a partially negative charge because of the unequal sharing of electrons.
Section: 02.03
Topic: Chemistry; Chemistry of Water
Bloom's: 6. Create
Learning Outcome: 02.03.01 Describe how water associates with other molecules in solution.

36) Draw several (5 or 6) individual, unbonded water molecules. Simulate what happens when table salt (Na^+Cl^-) is added to water. Use the model you created to explain why salt is added to the roads in a "snowy," cold climate.

Answer:



There is an attraction of positively charged sodium ions to the partially negative oxygen in water. The negatively charged chloride ions are attracted to the partially positively charged hydrogen atoms in water molecules.
The presence of the sodium and chloride ions interferes with hydrogen bonding between water molecules and thus depresses the freezing point of water. This lowers the temperature at which ice will form on the roads.
Section: 02.03
Topic: Chemistry; Chemistry of Water
Bloom's: 6. Create
Learning Outcome: 02.03.01 Describe how water associates with other molecules in solution.

37) Following nitrogen (78%) and oxygen (21%), argon is the next most common gas in the atmosphere (less than 1%). Checking the table of elements, you discover that argon is one of a family of atoms with outer shells already full of electrons. How is this related to the fact that these atoms have virtually no biological importance?

Answer: Argon has an outer shell with eight electrons. These atoms are stable, ordinarily not reacting with other atoms. Therefore, argon only exists as a pure substance which has no biological imporantance.
Section: 02.01
Topic: Chemistry; Chemical Elements
Bloom's: 3. Apply
Learning Outcome: 02.01.04 Determine how electrons are configured around a nucleus.
Accessibility: Keyboard Navigation

38) Which of the following substances attract water molecules?
A) a nonpolar substance
B) a polar substance
C) an ionic substance
D) Both polar and ionic substances.
E) All of the above will attract water molecules.

Answer: D
Explanation: Since water is a polar molecule and has charges, it is attracted to other substances with charges. Nonpolar substances do not have charges and therefore do not attract water.
Section: 02.03
Topic: Chemistry; Chemistry of Water
Bloom's: 2. Understand
Learning Outcome: 02.03.01 Describe how water associates with other molecules in solution.
Accessibility: Keyboard Navigation

39) Study the chart to determine the relationship between H^+ concentration and pH. If you were to create a herbal remedy to decrease excess stomach acid, would you create a solution with a relatively greater or lesser number of hydrogen ions?

$[H^+]$ (moles per liter)		pH
0.000001	$= 1 \times 10^{-6}$	6
0.0000001	$= 1 \times 10^{-7}$	7
0.00000001	$= 1 \times 10^{-8}$	8

Answer: Study of the chart confirms that as pH decreases, the concentration of H^+ increases. Acidity is associated with pHs below 7.0. Therefore, as the pH decreases and acidity increases, the concentration of H^+ increases. There is an inverse relationship between the pH and H^+ concentration. To neutralize excess stomach acid, one would create an herbal medication with lower concentrations of H^+. Solutions with lower concentrations of H^+ would have relatively higher pHs.
Section: 02.04
Topic: Chemistry; Acids and Bases
Bloom's: 3. Apply
Learning Outcome: 02.04.02 Explain the relationship between H or OH- concentration and pH.

40) A solution with a pH of 7.0 has _____ times _____ H^+ than a solution of pH 10.
A) 30; more
B) 300; less
C) 1000; more
D) 1000; less
E) None of these are correct.

Answer: C
Explanation: A solution with a pH of 7.0 has 10^3 times more H^+ than a solution of pH 10.
Section: 02.04
Topic: Chemistry; Acids and Bases
Bloom's: 2. Understand
Learning Outcome: 02.04.02 Explain the relationship between H or OH- concentration and pH.
Accessibility: Keyboard Navigation

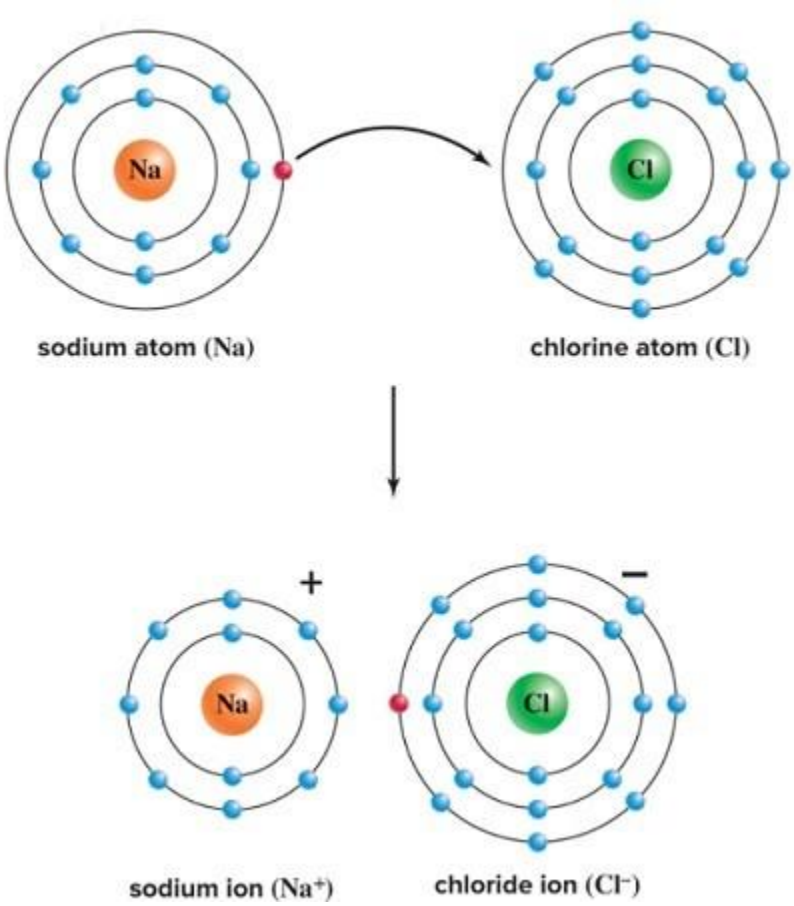
41) A solution with a pH of 6 has _____ times _____ OH^- than a solution with a pH of 10.
A) 40; more
B) 4000; less
C) 10,000; less
D) 4; less
E) 10,000 more

Answer: C
Explanation: A solution with a pH of 6.0 has 10^4 times less OH^+ than a solution of pH 10.
Section: 02.04
Topic: Chemistry; Acids and Bases
Bloom's: 2. Understand
Learning Outcome: 02.04.02 Explain the relationship between H or OH- concentration and pH.
Accessibility: Keyboard Navigation

42) This system of chemicals, $H_2CO_3 \rightleftharpoons H^+ + HCO_3^-$, act as a buffer in the blood. If hydrogen ions are added to blood which of the following reactions would occur?
A) $H^+ + HCO_3^- \longrightarrow H_2CO_3$
B) $OH^- + H_2CO_3 \longrightarrow HCO_3^- + H_2O$

Answer: A
Explanation: If hydrogen ions are added to blood, bicarbonate ions would combine with the acid forming carbonic acid.
Section: 02.04
Topic: Chemistry; Acids and Bases
Bloom's: 4. Analyze
Learning Outcome: 02.04.03 Analyze how buffers prevent large pH changes in solutions.

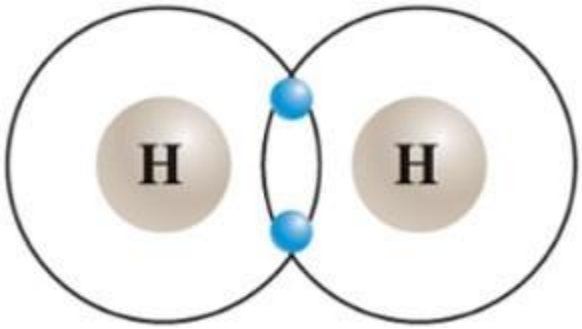
43) Use Bohr's model to draw a sodium (Na) atom and a chlorine (Cl) atom. Using your model, explain what happens when sodium reacts with chlorine to form table salt. Include in your explanation ion and ionic bond formation.



Answer: Sodium donates an electron to chlorine to form a sodium ion (Na^+) and a chloride ion (Cl^-). Ions are charged particles that have an unequal number of protons and electrons. These ions are oppositely charged and are, therefore, attracted to each other. The attraction between oppositely charged ions that were formed by a transfer of electrons is an ionic bond.
Section: 02.02
Topic: Chemistry; Molecules and Compounds
Bloom's: 6. Create
Learning Outcome: 02.02.01 Describe how elements are combined into molecules and compounds.

44) Draw two hydrogen atoms using Bohr's model. Now bond them to form a molecule of hydrogen gas. Write the molecular formula. Explain what type of bond you've created and why this is a stable situation.

Answer:



The molecular formula is H_2. A nonpolar covalent bond is created when two atoms of the same element equally share a pair of electrons. Through sharing, both atoms now have a completed outer shell with two electrons. This is a stable molecule.
Section: 02.02
Topic: Chemistry; Molecules and Compounds
Bloom's: 6. Create
Learning Outcome: 02.02.03 Explain the difference between a polar and a nonpolar covalent bond.

45) The electrons are unequally shared in _____, and transferred in _____.
A) H_2O; Na^+Cl^-
B) O_2; CH_4
C) Na^+Cl^-; H_2O
D) CH_4; N_2

Answer: A
Explanation: Correct.
Section: 02.02
Topic: Chemistry; Molecules and Compounds
Bloom's: 3. Apply
Learning Outcome: 02.02.02 List the different types of bonds that occur between elements.
Accessibility: Keyboard Navigation

46) What is the maximum number of electrons that will be in the first valence shell?
A) two
B) one
C) three
D) six
E) eight

Answer: A
Explanation: The first valence shell will hold a maximum of two electrons.
Section: 02.01
Topic: Chemistry; Chemical Elements
Bloom's: 1. Remember
Learning Outcome: 02.01.04 Determine how electrons are configured around a nucleus.
Accessibility: Keyboard Navigation

47) If an element contains eight electrons how many electrons will be placed in the second valence shell?
A) 6
B) 2
C) 8
D) 5
E) 11

Answer: A
Explanation: The first valence shell will have two electrons which will leave the remaining six to go in the second valence ring.
Section: 02.01
Topic: Chemistry; Chemical Elements
Bloom's: 2. Understand
Learning Outcome: 02.01.04 Determine how electrons are configured around a nucleus.
Accessibility: Keyboard Navigation

48) How many atoms are required to form a molecule?
A) at least two
B) at least three
C) at least four
D) at least five
E) only one

Answer: A
Explanation: A molecule that is formed with two or more of the same type of atom are bonded together.
Section: 02.02
Topic: Chemistry; Chemical Elements
Bloom's: 2. Understand
Learning Outcome: 02.02.01 Describe how elements are combined into molecules and compounds.
Accessibility: Keyboard Navigation

49) Which type of covalent bond is the strongest?
A) single
B) double
C) triple
D) quadruple
E) All covalent bonds are equal in strength.

Answer: C
Explanation: Triple covalent bonds are the strongest covalent bond.
Section: 02.02
Topic: Chemistry; Molecules and Compounds
Bloom's: 2. Understand
Learning Outcome: 02.02.02 List the different types of bonds that occur between elements.
Accessibility: Keyboard Navigation

50) Which term refers to the attraction of water molecules to one another?
A) adhesion
B) cohesion
C) hydrolysis
D) photolysis
E) polarity

Answer: B
Explanation: Cohesion is the attraction of a water molecule to another water molecule.
Section: 02.03
Topic: Chemistry; Chemistry of Water
Bloom's: 1. Remember
Learning Outcome: 02.03.01 Describe how water associates with other molecules in solution.
Accessibility: Keyboard Navigation

51) Which substances are on the basic side of the pH scale?
A) baking soda, oven cleaner, and human blood
B) baking soda, oven cleaner, and urine
C) tomatoes, oven cleaner, and human blood
D) beer, vinegar, and black coffee
E) Great Salt Lake, oven cleaner, and tears

Answer: A
Explanation: Baking soda, oven cleaner, and human blood are all basic substances.
Section: 02.04
Topic: Chemistry; Acids and Bases
Bloom's: 1. Remember
Learning Outcome: 02.04.01 Distinguish between an acid and a base.
Accessibility: Keyboard Navigation

52) Which one is NOT one of the properties of water?
A) The frozen form is more dense than the liquid form.
B) Water moderates temperature.
C) Water is a solvent.
D) Water has a high heat capacity.
E) Water has a high heat of evaporation.

Answer: A
Explanation: The frozen form of water is NOT more dense than the liquid form.
Section: 02.03
Topic: Chemistry; Chemistry of Water
Bloom's: 1. Remember
Learning Outcome: 02.03.02 Describe why the properties of water are important to life.
Accessibility: Keyboard Navigation

53) Which property of water allows it stick to surfaces like glass?
A) adhesion
B) high heat of evaporation
C) high heat capacity
D) Water is a good solvent.
E) The frozen form is less dense than the liquid form.

Answer: A
Explanation: Because water molecules have charges, they like to stick to other things with charges such as glass. Adhesion describes the attraction of water molecules to other charged substances.
Section: 02.03
Topic: Chemistry; Chemistry of Water
Bloom's: 1. Remember
Learning Outcome: 02.03.02 Describe why the properties of water are important to life.
Accessibility: Keyboard Navigation

54) The mass number refers to the number of _____ and _____ within an element.
A) protons; neutrons
B) protons; electrons
C) electrons; neutrons
D) protons; molecules
E) electrons; atoms

Answer: A
Explanation: The mass number is the sum of the number of protons and neutrons in an element.
Section: 02.01
Topic: Chemistry; Chemical Elements
Bloom's: 1. Remember
Learning Outcome: 02.01.02 Use the periodic table to evaluate relationships between atomic number and mass number.
Accessibility: Keyboard Navigation